Space Weather Technical Forecast

Issued on Saturday, 26 February 2022 at 12:16 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Increasing electron fluence probable. Slight chance of G1/Minor Storm and R1/Minor radio blackouts.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity reached Low levels, with a single C5 flare observed at 25/2143 UTC, from a region just beyond the southeast limb and probably related to ex-2939. There are currently two numbered sunspot regions on the visible disc. AR2954 and AR2955 are both classified as Hsx/Alpha and are located in the northeast quadrant but approaching centre disc.There has also recently been a minor un-numbered spot emerged in the northeast and classified as Axx/Alpha. No Earth-directed CMEs were observed in the available imagery during the past 24 hours.

Solar Wind / Geomagnetic Activity: The solar wind, as measured by DSCOVR and ACE at L1, was initially at slightly elevated levels but decreased gradually to around 380 km/s. The density was at average levels, 4-7 ppcc. The IMF, Bt, was weak at 2-5nT. The north-south component, Bz, varied weakly between +5nT and -2nT. Phi angle was largely positive (away from the Sun). Resultant geomagnetic activity was Quiet to Unsettled (Kp 0-2).

Energetic Particles / Solar Radiation: The high energy proton flux (10MeV) measured at GOES 16 was at background levels. The high energy electron flux (greater than 2MeV) has been at normal background to moderate levels, peaking at 898 pfu at 25/1720 UTC. The corresponding 24-hour integrated electron fluence remained flatly below the Active (1e8 integrated pfu) threshold with the 26/0000 UTC observation showing 2.98e7 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is forecast to be low or very low, with a chance of C-class flares. Risk of M-class flares is slight currently with an increasing chance as potential new regions rotate onto the disc in the coming days.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs are currently forecast. A series of coronal hole high speed stream (HSS) connections are expected during this period, with winds likely to exceed 500km/s at times. Geomagnetic activity is expected to be Quiet to Unsettled, with a chance of Active periods, and a slight chance of G1/Minor Storm intervals.

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux is expected to remain at background levels. High energy electron flux is likely to follow an erratic rising trend, with the likelihood of exceeding the high (1e3pfu) threshold during diurnal peaks. Electron fluence is also forecast to follow a rising trend, and may approach the Active (1e8 integrated pfu) threshold later in the period, although currently expected to remain just below. Confidence is low however.

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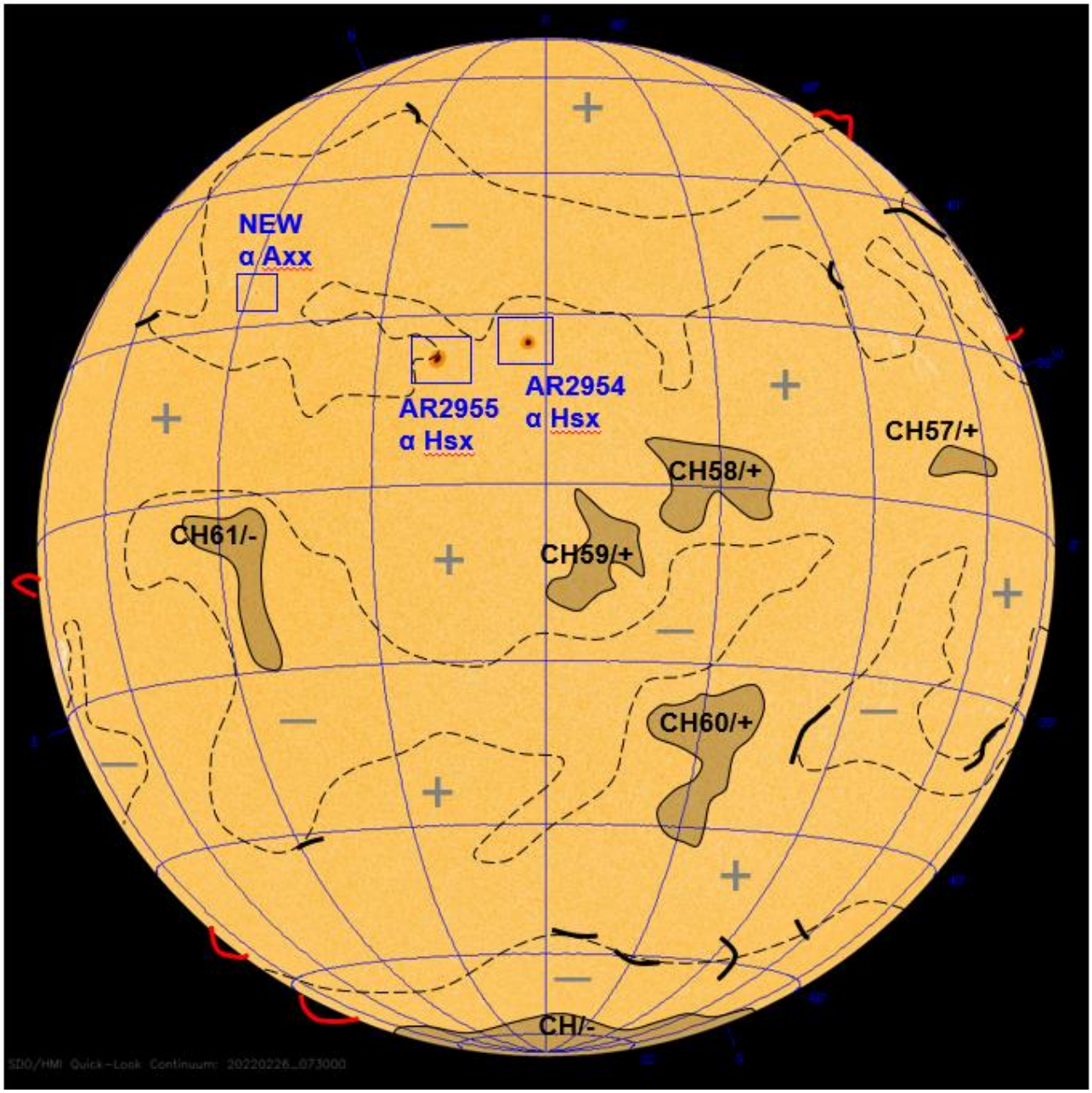
Figure 1. Solar Analysis Valid 26/0800 UTC.



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Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

There are currently no Earth-directed CMEs forecast.

Solar winds are currently at background levels. Connection with coronal hole 58 is likely on Days 1 or 2 (26-27 Feb), with a further connection with coronal hole 59 then probable on Days 2 or 3 (27-28 Feb). Solar wind speeds from these holes are expected to exceed 500km/s at times, and it is probable that the effects will merge, making it difficult to tell the individual features apart when they arrive at L1. These features appeared weaker in imagery on the previous rotation, and wind speeds from the previous rotation were also contaminated by CME arrivals.

The upcoming coronal holes are all positive polarity, which are less favoured for a geomagnetic response at this time of year. As such, geomagnetic activity is expected to be Quiet to Unsettled, with a chance of Active periods, and a slight chance of G1/Minor Storm intervals throughout.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	10	10	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Nil.

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Radio Blackouts - X-Ray Flares:

Solar activity reached Low levels. There are two mature and apparently stable numbered sunspots on the visible disc. AR2954 and AR2955 are both classified as Hsx/Alpha and have shown little activity. There has also recently been a minor un-numbered spot emerged in the northeast and classified as Axx/Alpha. Further possible active regions are beginning to rotate around the east limb onto the visible disc, with farside imagery suggesting that these could present a slight risk (10-20%) of M-class flares. This chance may increase as the new regions emerge more fully. A C5 flare observed at 25/2143 UTC appears to have originated from one of these regions and may have been from either Ex 2939 or Ex 2944 which were observed during the previous rotation.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	10	20	20	20
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (10MeV) measured at GOES 16 is at background levels, and expected to remain at this level with no solar radiation storms occurring.

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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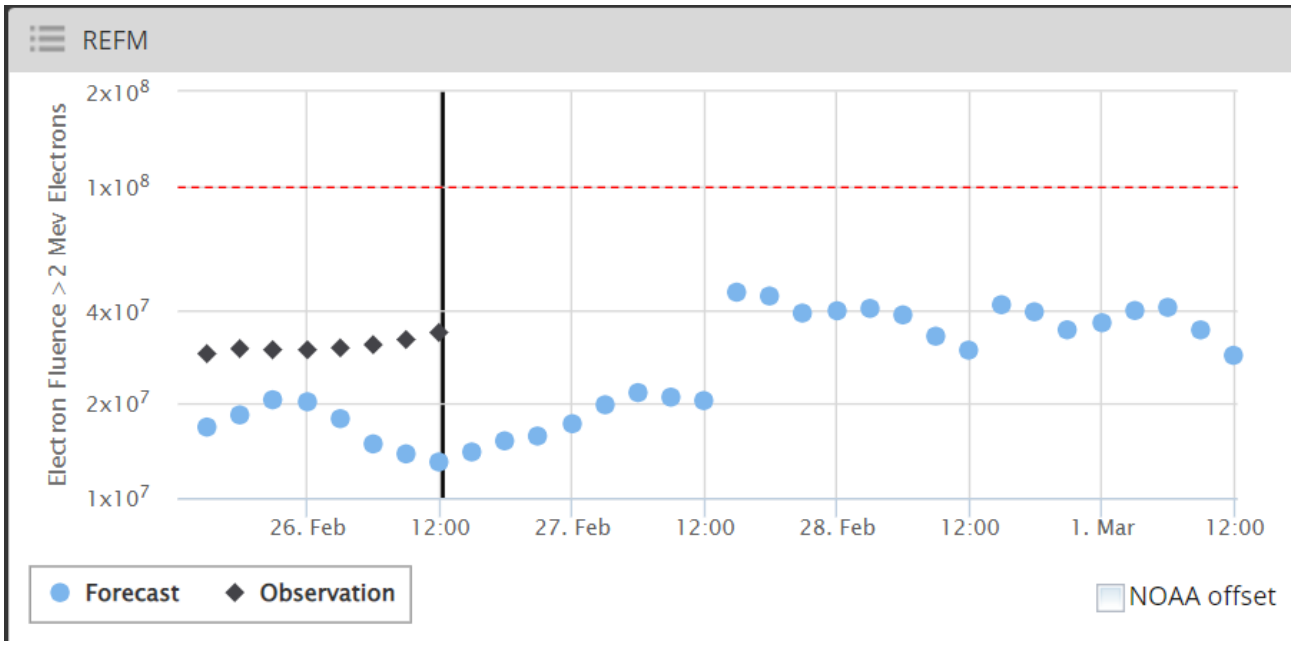
High Energy Electrons Event (≥ 2MeV):

High energy electron flux (greater than 2MeV) has reached moderate levels at the diurnal maxima in recent days, with an increasing trend in the diurnal peak. With Earth expected to be affected by various high speed streams in the coming days further charging will occur. Any CIR associated with these arrivals may cause temporary suppressions, however a general increasing trend is most probable over coming days, but with some variation in the peak values day to day. Associated electron fluence is likely to rise due to charging from the various high speed streams, but will probably stay just below the Active (1e8 integrated pfu) threshold. Confidence is low however, due to the uncertainty surrounding the charging / suppression cycle of several high speed streams in the coming days.

GEO Electron Environment Probability (Exceedance)	Level ($cm^{-2}\,sr^{-1}\,day^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	10	20	30	30
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 2: MOSWOC REFM.



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